PATHWAYS of Discovery

Evolving roles of BASIC SCIENCES in a transformed School of Medicine and Public Health
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Introduction

**VISION:** Basic sciences in the University of Wisconsin School of Medicine and Public Health will advance human knowledge, prepare our students for the practice of medicine and the pursuit of research, and contribute to the improvement of the quality of life in Wisconsin and beyond.

**MISSION:** Basic sciences in the University of Wisconsin School of Medicine and Public Health are a multi-faceted enterprise focused on fundamental research as a means to advance knowledge, teach and inform our students and trainees, and contribute to our effectiveness in promoting the Wisconsin Idea.

The basic sciences provide essential platforms for the generation and dissemination of new knowledge related to human health and disease. Fundamental studies in the biomedical sciences, population health sciences, and the social sciences together serve as the basis for advancements in human health. The UW School of Medicine and Public Health has a storied history in fundamental research that has advanced our understanding of systems ranging in complexity from individual molecules to human populations. In the past decade, the Medical School has become the School of Medicine and Public Health, and both the Wisconsin Partnership Program and the Institute for Clinical and Translational Research have been created and institutionalized. These are exciting, innovative programs that will nourish and advance the basic sciences within the portfolio of activities at SMPH, and provide a framework for the basic sciences to evolve within a rapidly changing research and funding environment.

Today, we are engaged in a remarkable evolution in technology that is reshaping the basic sciences. Advances in genome editing, imaging and informatics are enabling entirely new areas of scientific research. Many of these new advances require cross-disciplinary or computational approaches that are strengths at the University of Wisconsin. Leveraging these existing strengths, while strategically building in new areas, is imperative if we are to remain leaders in this dynamic research environment.

The emerging cross-disciplinary research environment requires collaborative work by teams of scientists having diverse areas of expertise. Additional organizational structures beyond traditional departments and research centers are needed to ensure that the requisite intellectual power and resources are brought to bear on complex problems. In light of the continuing constraints in federal research budgets, it is often difficult for an individual investigator to secure sufficient extramural funding to support even a medium-sized group. Developing multi-investigator research teams within the same or complementary disciplines will speed the pace of discovery and enhance competitiveness for extramural funding.

Maintaining the stature of UW SMPH as a leader in fundamental research in an austere fiscal climate requires judicious and focused application of its resources. Historically, the great strengths of the UW SMPH in the basic sciences have been drawn largely from its excellent, productive, and innovative faculty. Major programmatic areas have been built, and the core research resources to
Introduction (con’t)

support them have been developed, because individuals or small groups of faculty have championed them. Now there is pressing need to assess our resources and engage in iterative planning to ensure that we pursue promising, innovative initiatives that will advance the basic sciences.

Providing exemplary education to health professional and graduate students is a defining core mission of the UW School of Medicine and Public Health. Teaching relevant basic science content along with critical thinking and problem solving skills is a key component of that core mission. Because of the inherently dynamic nature of the basic sciences, the education of health care professionals is an ever-evolving process with multiple demands, challenges, and opportunities. Collectively, educators must convey a vast array of topics to a broad spectrum of learners in settings varying from the classroom to the laboratory to the clinic. Optimizing an integrated interdisciplinary approach to education is necessary to meet increasingly robust requirements for funding accreditation, and professional licensing. With current plans for major curriculum reform in medical education underway, we are now poised to make transformative changes to our existing approaches to deliver and support basic science education. Importantly, continuous quality improvement in educational programming that is directly responsive to the changing health care and scientific landscape is absolutely necessary to improve patient care and optimize health outcomes for individuals, families, and populations into the future.

To ensure that SMPH is optimally positioned to tackle all of these challenges, we have undertaken a strategic planning effort which has identified the key actions that will promote our continued success. These actions, outlined on the following pages, represent a roadmap as we navigate the evolving landscape of fundamental research and education in the coming years.

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Dean, School of Medicine and Public Health

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Research and Research Training

Our strengths across the continuum of research, education and clinical care contribute to the sustainability of our position as an international leader in each of these endeavors. Furthermore, the School of Medicine and Public Health is strategically positioned within a world class research university where talented faculty and staff members are passionate about discovery, where innovation and collaboration in research and training are valued highly, and where top-notch research trainees are recruited nationally and internationally. Our research benefits from campus affiliations and collaborations and our training programs are enriched through participation in cross-disciplinary training activities. We also embrace the “Wisconsin Idea” which extends our opportunities for research and training across the state, nation and world. Emerging technology now provides us with unprecedented opportunities to approach research problems in new and different ways.

Strategic planning in the basic sciences has identified opportunities to embrace new directions in research and to define, evaluate and implement innovative training paradigms to prepare our graduates to contribute to, and to lead, the continuing evolution of scientific discovery.

Priorities for fundamental research and research training

**Identify top-priority research themes by:**
1) employing a faculty committee to advise the Office of Senior Associate Dean for Research, Biotechnology and Graduate Studies on investment in new research areas,
2) capitalizing on existing research strengths and our culture of collaboration, and
3) exploiting funding opportunities in basic science research in both new areas and areas of existing strength such as obesity and metabolism, human genomics, microbiomes, immunology, brain science, and systems biology.

**Enhance administrative infrastructure by:**
1) providing administrative support for grant proposal preparation, multi-investigator projects and regulatory compliance,
2) offering support for pilot and bridge funding awards, and
3) reducing bureaucracy.

“Evil dendrites”, dissociated hippocampal neurons cultured in microfluidic chamber. Dendrites are stained red.
Cell Image: Dr. Ed Chapman lab, department of Neuroscience
Research and Research Training (con’t)

Improve research core facilities to enhance research programs by:
1) developing SMPH capabilities in imaging, deep-sequencing, bioinformatics, metabolomics and metabolism phenotyping, drug discovery and development, and infrastructure for population-based studies,
2) serving both expert and non-expert core users, and
3) providing facility oversight by means of a committee comprised of faculty and staff.

Develop a well-trained scientific workforce by:
1) appointing a faculty/staff committee to advise the Office of Senior Associate Dean for Research, Biotechnology and Graduate Studies on best practices in training of graduate student and postdoctoral fellows,
2) ensuring that graduate students and postdoctoral fellows are trained for specific career opportunities across the spectrum of science,
3) improving research training by optimizing the quality and size of graduate programs, enhancing professional development, improving curricula, and considering models for integrated admissions, and
4) increasing the opportunities for continued professional development of faculty and staff.

SMPH Trainee Poster Fair.
Team Science

Research problems have become increasingly challenging due to the emerging complexity of biological processes. Because of this complexity, new understanding is best achieved using approaches that typically involve two or more investigators in multidisciplinary teams. The differing perspectives of team members accelerate the pace of discovery and may even elevate a project in ways that are not accessible to an individual investigator. Characteristics contributing to success in team science include the collective expertise of the investigators, shared scientific interests, respect, and trust. The SMPH has developed diverse platforms that promote team science, such as thematic centers and programs. Nevertheless, the extraordinarily collaborative environment in the SMPH and across campus provides a critical foundation for even greater initiatives in team science. Strategic planning has resulted in a series of compelling recommendations to increase the quantity and quality of team science.

Implementing these recommendations promises to yield high-impact fundamental discoveries in key research areas such as cancer, cardiovascular disease, neurosciences, metabolic disease, and regenerative medicine and many-fold benefits for science, medicine, and public health.

Priorities for facilitating the development of multi-investigator research

Develop leadership for team science by:

1) actively recruiting, encouraging, and supporting leaders,
2) facilitating success through leadership training, administrative support, and time release, and
3) showcasing the impact of successful team science initiatives.
Promote a team science culture by:

1) more aggressively encouraging and supporting team science through incentives such as endowed chairs, personal financial incentives, and strategic sabbaticals,

2) empowering centers and programs through financial support to initiate and sustain multi-investigator research, and

3) promoting collaborations within UW-Madison and with other universities, research institutes (including Morgridge Institute for Research), and industry.

Increase the resources available for developing and supporting team science by:

1) reallocating existing resources to catalyze the development of extramurally funded team science,

2) providing central administrative infrastructure to facilitate the development, submission, and management of team science proposals and funded projects,

3) investing in existing and new technologies such as proteomics, genomics, imaging, and computation to support innovation,

4) more effectively showcasing our successes and impact when engaging philanthropists, foundations, NIH, and the private sector, and

5) increasing school and campus efforts to inform funding agencies of our unique strengths and capabilities for team science, with the goal of expanding our opportunities for funding.

Cancer cells depicting interphase and multiple stages of mitosis. Red shows microtubules, DNA is shown in blue. Cell Image: Dr. Beth Weaver, the department of Cell and Regenerative Biology
Resource Allocation

Institutional support, initiatives, and infrastructure needed to perform effectively as a top-tier research institution have become increasingly costly. As we plan for the future, it is critical for us to strategically invest our resources, develop new models for funding, and work even more collaboratively than in the past across the scientific enterprise within the SMPH and across campus. The path forward necessarily involves selective investments in high-priority research programs and greater support of basic science faculty to advance research and teaching and to ensure that we retain key contributors in the face of outside recruiting pressures.

There is a particular need to create a new administrative infrastructure to facilitate the development of collaborative grants and to alleviate the burden of regulatory and compliance reporting requirements. A more robust system of developing, supporting and decommissioning research cores is needed, and this system needs to emphasize the power of those cores to advance discovery along a continuum which emphasizes basic science as a key component on the path to translation, dissemination, and implementation. The

SMPH is bound to campus systems for determining compensation, which has not kept pace with national norms—we need to develop an SMPH-centric system to reward extraordinary performance in research and teaching, without forsaking the shared value of compensation equity.

Priorities for resource allocation in support of basic science missions

Invest in long-term and ongoing individual faculty development by:

1) expanding competitive bridge funding for current faculty even at the risk of drawing down resources for retention, salaries, and start-up packages,
2) implementing substantial, limited-term compensation adjustments based on extraordinary performance, and
3) ensuring that faculty are aware of resources that are available to them at department, school and university levels, and through core research facilities, and
4) increasing the support for faculty sabbaticals.

Basic Science Source of Funds
FY 2015 Budget

- State/School Funds - Departments 25%
- State/School Funds - Centers & Training Programs 4%
- Grant Funds 3%
- School Gift Funds 3%
- Departmental Gift Funds 2%
- Indirect Costs 6%
- Core/Chargebacks 1%
- Other 4%
Resource Allocation (con’t)

Develop new or increased funding by:
1) identifying and communicating opportunities for multi-investigator grants and providing infrastructure to support submissions in response to Requests for Applications (RFA’s),
2) strengthening relationships with private foundations, identifying funding opportunities, and communicating funding announcements to faculty and staff,
3) enhancing collaboration with industry by streamlining contract negotiation,
4) increasing philanthropic support by engaging national philanthropic efforts to support basic sciences and developing an SMPH seed fund to leverage philanthropic support for basic research.

Enhance the strength of our core resources to advance the basic sciences by:
1) emphasizing a multidisciplinary continuum of discovery that emphasizes basic science whenever evaluating or developing the portfolio of SMPH support for cores and pilot programs,
2) appointing a faculty/staff committee to advise the Office of the Sr. Associate Dean for Basic Research, Biotechnology and Graduate Studies on issues related to developing, sustaining and sun-setting core facilities, and,
3) developing business and operating guidelines for core facilities including appropriate staffing, benchmarks for success, and effective marketing strategies.
Basic Science in Medical Education

Through a process of continuous improvement of our educational enterprise, we are ideally poised to boldly reshape basic science education for all students in the health professions (i.e., GC, MPH, PA, PT, MD, MD/PhD) at the School of Medicine and Public Health. We must thoughtfully balance and align the value placed on education with the research and clinical missions both within and beyond departments.

**Priorities for future contributions to health professions education**

**Develop and incentivize great teaching by:**

1) identifying and embracing best teaching practices across campus,
2) providing educational programming and regular feedback for professional development of teachers,
3) protecting time and providing resources for faculty to teach, learn, and innovate, and
4) creating an infrastructure for community of health sciences leaders and educators to build and sustain excellence in education.

**Create a sustainable and nimble funding model to support integrated interdisciplinary and interprofessional education that is transparently aligned with institutional metrics for excellent quality and innovative curricular initiatives by:**

1) holding educational leaders and teaching faculty accountable for achieving goals for excellence, continuity, innovation, and integration,
2) building a stronger central education leadership model that partners closely with departments to reach integrated and interprofessional curricular goals across the school,
3) developing leadership teams for courses that consist of co-leaders with clinical and basic science expertise, and
4) identifying teachers from different departments to lead educational initiatives through a competitive best-fit process.

**Embrace continuous quality improvement practices to sustain great teaching by:**

1) identifying and disseminating desired outcomes,
2) analyzing and adjusting teaching practices based on outcomes,
3) developing a robust rubric with evidence-based metrics to calibrate, improve, and recognize/reward great teaching, and
4) embracing diverse assessment methodologies that are well-aligned with curricular content and critical thinking goals.
SMPH Facts

- Faculty, trainees, and staff
  - 1464 Total faculty
  - 650 Basic Science PhD students
  - 231 Post-doctoral fellows
  - 1801 Academic Staff
  - 830 University Staff
- Extramural research support (FY2013-14)
  - $199 million in federal awards
  - $141.6 million in non-federal awards

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